REPORT DOCUMENTATION PAGE

Form Approved
OMB No. 0704-0188

Public reporting burden for this collection of information is estimated to average 1 hour per response, including the time for reviewing instructions, searching data sources, gathering and maintaining the data needed, and completing and reviewing the collection of information. Send comments regarding this burden estimate or any other aspect of this collection of information, including suggestions for reducing this burden to Washington Headquarters Service, Directorate for Information Operations and Reports, 1215 Jefferson Davis Highway, Suite 1204, Arlington, VA 22202-4302, and to the Office of Management and Budget, Paperwork Reduction Project (0704-0188) Washington, DC 20503.
PLEASE DO NOT RETURN YOUR FORM TO THE ABOVE ADDRESS.

1. REPORT DATE *(DD-MM-YYYY)* 12/15/2012	2. REPORT TYPE Technical Report	3. DATES COVERED *(From - To)* 11/1/2012 – 11/30/2012

4. TITLE AND SUBTITLE ENGAGE: A Game Based Learning and Problem Solving Framework	5a. CONTRACT NUMBER N/A
	5b. GRANT NUMBER FA8750-11-2-0102
	5c. PROGRAM ELEMENT NUMBER N/A
6. AUTHOR(S) Zoran Popović	5d. PROJECT NUMBER N/A
	5e. TASK NUMBER 1
	5f. WORK UNIT NUMBER N/A

7. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES) University of Washington, Office of Sponsored Programs 4333 Brooklyn Ave NE Seattle WA 98195	8. PERFORMING ORGANIZATION REPORT NUMBER

9. SPONSORING/MONITORING AGENCY NAME(S) AND ADDRESS(ES) Office of Naval Research One Liberty Center 875 North Randolph St. Arlington, VA 22203-1995	10. SPONSOR/MONITOR'S ACRONYM(S) ONR
	11. SPONSORING/MONITORING AGENCY REPORT NUMBER

12. DISTRIBUTION AVAILABILITY STATEMENT
Approved for public release; distribution is unlimited.

13. SUPPLEMENTARY NOTES

14. ABSTRACT

15. SUBJECT TERMS

16. SECURITY CLASSIFICATION OF:			17. LIMITATION OF ABSTRACT SAR	18. NUMBER OF PAGES	19a. NAME OF RESPONSIBLE PERSON Zoran Popović
a. REPORT Unclassified	b. ABSTRACT Unclassified	c. THIS PAGE Unclassified			19b. TELEPONE NUMBER *(Include area code)* (206) 616-2660

Zoran Popović
ENGAGE: A Game Based Learning and Problem Solving Framework (Task 1 Month 9)
Progress, Status and Management Report
Monthly Progress Report

Submitted by:

Zoran Popović
185 Stevens Way AC101
Seattle, WA 98195

Telephone: (206) 616-2660
Fax: (206) 543-2969
Email: zoran@cs.washington.edu

Technical Information

1. Technical Progress / Highlights - Observations

We have completed integrating the themed pre- and post- tests into Refraction, Treefrog Treasure, and Creature Capture. The tests are randomized in a way that answers are not the same spatially across each test (to use a comparison question as an example, if the student needs to place <, >, <, and = in the upper left, lower left, upper right, and lower right, in Version 1 of the test, in Version 2 does not echo the same placement of the symbols with new numbers, in case the student remembered the order of the answers.

We trained people from both the Learning Science and Computer Science teams on the behavioral and affective data collection protocol created by Ryan Baker from Columbia. We are now starting the trials at University Child Development School (UCDS) and Interagency Academy (part of Seattle Public Schools), collecting this data as well as our standard logging of gameplay actions.

Use of the games in school settings has already surfaced numerous small bugs and polish items for the games; we are reacting to this feedback immediately and, in some cases, turning around a new version of the game for the next day of classes (while still taking care not to alter the math content of the games). Some of those points are detailed in the section below.

We also received much positive feedback about the way the games were received by the students, even at this early stage. Here is a field report with some highlights from Treefrog Treasure:

> Oh, and overall, kids LOVED the game. And not just the elementary kids. I was with the alternative school kids this afternoon (middle and high school aged). A couple quotes:
>
> - One kids says, "that was kinda fun and I never have fun in that class"
> - One kids asked what we were up to and another teacher nearby said, "learning games" and boy 3 said, "they're hella fun".
> - Another kid yells out, "Can we do this everyday Mr. McCracken?" Most of the rest of us laugh.
> - There were also a lot of "This is crackin'" comments, one kid compared it to Sonic (in a good way), and another kid wants it on his 360.

We interviewed numerous candidates for the Community Manager position and have narrowed it down to two final candidates. We also completed the request for opening the Math Content and Experience Tester position as described in our communications.

Preliminary design work and planning was done this month towards an investigation of growth mindset as relates to our games. The growth mindset is defined as a mindset where students see intelligence not as a fixed quality they are born with, but rather a quality that they can grow through effort and hard work. In particular, the growth mindset teaches that the brain is a "muscle" that one can make stronger through mental exercise. To study whether we can influence player's mindsets about learning through our games, we are looking at developing and studying different feedback and reward structures.

2. Results or Problems and Solutions

We have begun to make adjustments to the games based on the play we have seen in the classroom. Two important examples of this are:

- Adjustments to progression length based on average time to complete the level packs - As the schools give us certain windows of time to let the students play the games, an important part of our adjustment is finding the right amount of gameplay to give to the kids. Different kids

complete the game at wildly different speeds, so in order to ensure that the kids get to try all of the games, we have reduced the number of levels in certain games. We do not believe this will adversely affect learning as the levels eliminated were "extra" levels designed to pad out the experience and keep in engaging in between assessments. The experience may be a little more test-heavy as a result, but it will also be more interesting over a number of days, as a greater number of games will be played.

- Development of measures to find students who did not take the assessment sections seriously - There were some reports of students simply clicking past the assessments without actually "doing" them. We believe we will be able to spot this in the logging data (the test will have been completed in mere seconds). Additionally, since the students were observed, the behavioral and affective data will show the students as "off task" during the period the test was present if they did not take it seriously.

3. Significant Accomplishments Anticipated During Next Reporting Period

We will continue in-classroom data collection with pre- and post-tests and gameplay data associated with behavioral and affective data will begin. Feedback on problems, bugs, or game design issues from the classroom will be immediately incorporated into the games (in some cases for the next day), allowing for rapid iteration on the game's design and implementation details.

4. Publications relevant to this effort

Educated Play! – Refraction. In *Game Developer* magazine, October 2012.

More than child's play: Games have potential learning and assessment tools, http://www.kappanmagazine.org/content/94/2/26.abstract, Vicki Phillips and Zoran Popović, *Phi Delta Kappan October 2012 vol. 94 no. 2 26-30*

New Game on GameUp: Center for Game Science presents "Treefrog Treasure". On BrainPOP, November 30th, 2012.

5. Meetings and Events (Please include meetings with subcontractors)

November 11, 2012. Prof. Dan Schwartz and his student Nicole Hallinen visited UW to discuss their potential involvement in the project, such as contrasting cases as a new game paradigm, what we can apply it to, how to construct experimental trials, and how we will automatically generate non-verbal contrasting cases learning progressions from a defined description of specific domain knowledge.

November 16, 2012. "The Crossroads of Engagement and Mastery in STEM Education." Washington STEM Breakfast Series, Seattle, WA.

6. Changes to the Contract Organization

As we have been discussing in previous reports and other communication, the UTA subcontract will be replaced by internal UW hiring and with external consultants from Stanford University. We have provided what we believe is all of the requested information regarding this change as of November 15th.